Reviving Silk Road Soundscapes: Iconographic Transformations of Pipa Instruments (Northern Wei to Sui) and the Prospects of AI-Aided Musical Reconstruction

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Abstract

Building on the author's doctoral research that systematically classified and interpreted pipa imagery in Shanxi Province from the Northern Wei to Tang Dynasties using archaeological typology, this comprehensive study examines two representative iconographies: one from Cave 12 of the Yungang Grottoes ("Cave of Music") and another from the Tomb of Yu Hong, a Sogdian noble of the Sui Dynasty. Through these case studies, the paper examines how cross-cultural exchanges between agrarian Han society and nomadic steppe cultures led to structural innovations and the evolution of performance aesthetics in pipa instruments. Additionally, the study takes the 14th piece from the Dunhuang pipa manuscripts, You Man Quzi, as a case study to explore its potential for reconstruction and adaptation in contemporary pipa performance. It further presents a preliminary inquiry into the potential role of artificial intelligence in assisting with the revival and creative interpretation of ancient Chinese scores for modern contexts.

Keywords: Pipa iconography, Yungang Grottoes, Yu Hong Tomb, archaeological typology, cross-cultural exchange, Dunhuang pipa manuscripts, AI music reconstruction

Introduction

The pipa, a lute-like instrument, occupies a pivotal position in the history of Chinese music. Its development from the Northern Wei (386–534 CE) to the Sui Dynasty (581–618 CE) reflects complex processes of cultural exchange along the Silk Road, where Han agricultural society interacted with nomadic

steppe peoples and Central Asian merchants, including the Sogdians and Persians. These interactions shaped not only the physical form of the instrument but also its performance practices and aesthetic presentation.

This study aims to address the following questions:

1) How did pipa form and playing technique evolve under the influence of cross-cultural exchanges in Shanxi during the Northern Wei to Sui periods?

2) How can archaeological typology and iconographic analysis reveal patterns in the historical development of the pipa?

3) What is the potential role of artificial intelligence in the reconstruction and creative adaptation of ancient pipa scores for contemporary performance?

By situating iconographic analysis within a broader framework of cultural interaction and digital experimentation, this paper contributes to an integrated understanding of musical instruments as both material and performative cultural artifacts.

Literature Review

Research on the pipa has long been a subject of interest in Chinese musicology, archaeology, and iconography. Previous studies have examined the instrument's evolution in terms of physical form, musical function, and symbolic representation. Scholars have conducted research on the history of the pipa, with main concentrations in China and Japan. In the research on the history of the pipa in the 20th century, the representative achievements in China include the monograph "History of Chinese Music" by Wang (2015), in which he mainly discussed the history of the pipa in terms of its shape, origin, evolution, and tuning. Through the study of tuning, he established connections and comparisons between the Arabian pipa (which Wang interpreted as the Persian oud based on its pronunciation) and the four-stringed curved-necked pipa, five-stringed pipa, and the pipa intr duced to Japan from the Tang Dynasty. He believed that these pipas were all related and inherited from one another. Through the comparison of tuning, Wang believed that the predecessor of the four-stringed curved-necked pipa in China was actually the Suyiwa pipa mentioned in the literature that came from Kucha, and that the five-stringed pipa developed by adding strings to the four-stringed curved-neck pipa on this basis. Based on the records in Du You's "Tongdian" from the Tang Dynasty and the "History of the Liang Dynasty", Wang believed that the round-bodied, straight-necked pipa (also known as the ruanxian) had already appeared in China during the Chen and Sui Dynasties. The Suyiwa pipa was just a Hu instrument with a sinicized name.

From the perspective of the academic materials and viewpoints at that time, Wang's use of tuning research to establish connections between different types of pipa-like instruments from other regions was an academically advanced and valuable approach.

The cross-cultural context of the Silk Road has also been emphsized. Research indicates that the pipa was influenced by Central Asian and West Asian musical traditions. Japanese scholars Hayashi (1962) and Kishibe (1962) in their relevant works, hold a relatively consistent view that the pear-shaped lute instruments (a category that includes the pipa) which appeared in China originated in West Asia, were also popular in regions like Central Asia, and spread into China via the Silk Road. When discussing specific types, these two scholars argue that the four-stringed, curved-necked lute (quxiang pipa) completed its formation and development in the Iranian region. In contrast, the five-stringed pipa originated from India. This is also a widely recognized viewpoint in the academic community regarding the study of the Chinese pipa's history. In particular, the discussions on the evolution of instruments such as the ruanxian and huobusi in Hayashi's Study of East Asian Musical Instruments have exerted an influence on the subsequent research of Chinese scholars. Meanwhile, the viewpoints put forward by scholar Tanabe (2015) in his History of Chinese Music can be summarized into two aspects:

1) The pipa in Japan was introduced from China. In contrast, the pipa in China should have emerged no later than the Han Dynasty (with its origin possibly tracing back to the Qin Dynasty), and was an instrument imported from the West.

2) He draws on comparative organological evidence to trace the possible predecessors of the ruanxian. Early examples include the bow-shaped harp (harpu) from Mesopotamia, which featured a sheepskin-covered soundbox and later developed into a three-stringed instrument. After its transmission to Egypt, this instrument type evolved into the nalfe, a lute characterized by a round soundbox covered with sheepskin. The instrument subsequently spread to Persia, where related lute forms became widespread. The viewpoint held by Tanabe (2015) aligns closely with that of Chinese scholar Shen (1982)—both believed that the ruanxian was merely a foreign-origin instrument that adopted a localized Chinese name. Tanabe further supported his argument by quoting records from Wenxian Tongkao (Comprehensive Examination of Literature and Documents) and historical accounts stating that the musical instruments unearthed from an ancient tomb during the reign of Empress Wu Zetian of the Tang Dynasty were identical to those used by Ruan Xian, one of the "Seven Sages of the Bamboo Grove."

Xie (2015), briefly outlined the forms of pipa-type instruments during the Tang Dynasty from the perspective of a contemporary pipa performer, mainly using the dual evidence method that combines music

iconography with philology for mutual verification. However, she did not conduct in-depth research in this regard.

With regard to material aspects of Tang Dynasty pipa-type instruments, including string construction, Xie Yazhu (2015) offers a relatively detailed discussion, especially concerning the transition from animal-based strings to silk strings and their impact on timbre and performance practice. This aspect of her study receives more focused attention than in many earlier works, which tend to treat such materials only briefly.

Nevertheless, the music scores cited and used by her to illustrate aspects such as performance and musical interpretation of Tang Dynasty pipa music are actually pipa scores that have been handed down in modern and contemporary times. These scores cannot serve as rigorous academic supporting materials for explaining the original appearance of Tang Dynasty pipa music.

Research findings on the imagery of pipa-type instruments also primarily focus on the Han and Tang Dynasties, as well as the regions along the Silk Road, for elaboration. A representative work in this field is "Sinicization and Classification: A Study on the Typological Characteristics, Performance Methods and Humanistic Existence of Pipa in the Han and Tang Dynasties" by Chen (2015). In this work, Chen put forward the term "humanistic existence" for the first time, which is used to describe the approach of situating the specific research object within a specific historical and humanistic context to investigate the cultural behaviors underlying the research object. He confined his study to pipa-type instruments of the Han and Tang Dynasties, which are also the dynasties that have attracted relatively concentrated attention in the academic research on pipa-type instruments. His research comprehensively covers various aspects of pipa-type instruments during this specific period, including different structural forms, diverse performance methods, the social and living status of pipa players, and the pipa music of this era. This type of research enables the study of pipa-type instruments to break free from the constraints of focusing only on superficial aspects, as seen in the structural forms depicted in images. Instead, it conducts in-depth research on the social and humanistic environment of that time.

Methodology

Data Collection

The researcher's doctoral dissertation research comprises all extant pipa-related imagery found in Shanxi Province, dating from the Northern Wei to the Tang Dynasties, comprising a total of 132 images. Sources include grotto wall paintings, tomb murals, sculptures, steles, and figurines. Each image was carefully documented to preserve key visual features, considering potential deterioration from environmental exposure. She employed the fieldwork method to conduct on-site investigations, identifying and counting all pipa images, providing preliminary descriptions of their characteristics, and compiling the findings into statistical tables.

Analytical Framework

The analytical framework employed in this study integrates archaeological, iconographic, comparative, and technological methodologies to achieve a comprehensive understanding of the pipa's evolution. Archaeological typology was applied to systematically code and classify each instrument according to three structural and performative criteria—neck configuration, soundbox morphology, and right-hand technique—thus generating stable digital records that contribute to the long-term preservation of cultural heritage threatened by material decay. Iconographic analysis involved a close examination of visual details, such as hand positions, plucking gestures, and performer attributes, to infer historical performance practices. Through cross-comparison, depictions from the Yungang Grottoes served as the typological benchmark for examining related instruments across Shanxi, revealing continuities and regional adaptations. Finally, AI-assisted reconstruction was employed to process selected Dunhuang pipa scores, exploring how artificial intelligence might facilitate the creative reimagining of ancient music within contemporary performance contexts.

Research Scope

The study focuses on the researcher's hometown, Shanxi Province in China, which has been a meeting point of nomadic civilization and agricultural civilization since ancient times, and a place where diverse cultures converge. Therefore, transmission routes and origins of pipa types outside this region are beyond its scope. However, observed patterns reflect broader Silk Road influences and regional cultural integration.

Case Studies

1. Yungang Grottoes (Cave 12, "Cave of Music")

Archaeological Context: Located on the east side of the ceiling in the antechamber of Cave 12, as recorded in Yungang Grottoes Complete Works: Volume 10, this mural presents one of the earliest known depictions of the pipa in Northern Wei Buddhist art. The musician is identified as a Yaksha performer, a mythical guardian figure often associated with divine music and celestial celebration. This image provides a valuable insight into early pipa morphology and performance techniques, serving as a foundational reference for later iconographic comparisons (Instrument Identification Code: 12-6-Qwll, see Table 1).

Instrument Form and Structure: As shown in Figure 1, the instrument features a curved neck, a long and wide neck shaft, and a pear-shaped resonance chamber with a slightly rounded profile. Although five white strings are visible in the image, the published plate caption in Yungang Grottoes Complete Works, Volume 10, Cave 12, notes that these strings were added during later color restoration by Qing Dynasty painters (1636–1912) and do not belong to the original sculptural design (Editorial Board of Yungang Grottoes Complete Works, 2019, p. 334). Accordingly, this instrument should be classified as a four-string curved-necked pipa, consistent with Persian-influenced forms prevalent along the Silk Road during the Northern Wei period.

Pipa-Holding Posture: The pipa is held with its headstock pointing downward to the left, positioned in front of the musician's chest. The chin does not touch the soundbox, indicating an inverted holding posture, where the instrument is played upside down relative to later conventional methods. This suggests an early stage of experimentation in performance practice.

Right-Hand Technique: The right wrist is pressed tightly against the edge of the resonance chamber, and the forearm is drawn close to the body. This compact motion may have facilitated a powerful and resonant tone, suitable for vigorous and rhythmically dynamic melodies. The slightly open "tiger's mouth" between the thumb and index finger and the outward "kicked" index finger indicate a hook-plucking motion, analogous to the mo (抹) technique in modern pipa playing, in which the index finger bends inward to pluck the string (Wang, 2012).

Left-Hand Technique: The left thumb supports the neck while the remaining four fingers press sequentially along the same string. The final pitch corresponds to the note pressed by the little finger, and the position—at the upper end of the neck—suggests performance in the lower tonal range, emphasizing depth and weight in tone production.

Representation of the Musician: The Yaksha musician has a tufted hairstyle, a joyful, upward-curving mouth, and is adorned with armlets, bracelets, and a beaded yingluo necklace. The figure wears trousers and exhibits a strong, athletic physique, reflecting the Central Asian (Hu) influence in physiognomy and costume. The twisted torso, bent left leg, and extended right leg give a sense of suspension and movement, symbolizing spiritual vitality and the dynamic energy of Buddhist sound imagery.

Accompanying Instruments: Though the pipa dominates the composition, surrounding fragments in the same cave indicate the presence of wind and percussion instruments, suggesting a proto-ensemble setting. This configuration provides the "Yungang model", later used as a typological reference for comparative analysis across Shanxi sites.

Figure 1: Pulse cover photo
Source: Editorial Board of Yungang Grottoes Complete Works.

2. Yu Hong Tomb (Sui Dynasty, Sogdian Nobleman)

Archaeological Context: The Yu Hong Tomb, excavated in 1999 and located south of Wangguo Village in Taiyuan City, Shanxi Province, dates back to the Sui Dynasty. According to Zhang (2010), Yu Hong, a nobleman from the Yu State, served as an envoy for the Rouran Khaganate and Persia from an early age and later held administrative positions under the Northern Qi, Northern Zhou, and Sui Dynasties. During the Northern Zhou period, he oversaw the Sabao Office, an institution managing foreign merchants and ethnic affairs. His epitaph and mural program together testify to his Central Asian heritage and the cosmopolitan identity of the period.

Instrument Form and Structure: The musical mural features a Qsl-type curved-necked pipa, a five-string variant with a droplet-shaped resonator, a smooth soundboard without sound holes, and no visible frets. These features demonstrate continuity with Persian and Sogdian instrument-making traditions observed earlier in the Yungang Grottoes, indicating the sustained influence of Silk Road aesthetics into the Sui Dynasty.

Pipa-Holding Posture: The performer holds the instrument with the pegbox angled slightly downward to the left, and the chin positioned close to the soundbox. The pipa rests lightly against the body, suggesting controlled balance and an ergonomic approach conducive to refined execution.

Right-Hand Technique: The right hand plucks the strings while only a small portion of the forearm touches the soundboard, providing flexibility and precision. The gesture indicates that the instrument was relatively lightweight and adaptable to intricate melodic playing, consistent with Central Asian plucked-lute performance styles.

Left-Hand Technique: The left hand presses directly onto the strings without frets, producing pitch variations through finger pressure and subtle sliding motions. The absence of frets implies a glissando-based tonal system, characteristic of Persian and Sogdian musical idioms, allowing expressive microtonal transitions.

Representation of the Musician: The musician exhibits a distinct foreign physiognomy—a high nasal bridge, deep-set eyes, and elaborate Sogdian attire. Such iconography affirms the representation of cross-cultural performers within the tomb's visual narrative, reflecting the artistic and social hybridity of the Sui court culture.

Accompanying Instruments: The ensemble includes a flute, depicted adjacent to the pipa player, symbolizing the blending of string and wind timbres. This pairing further underscores the integration of Central Asian and Chinese musical elements, embodying the transcultural dialogue that shaped Sui Dynasty performance practice.

Source: Photographed by the author at Shanxi Museum in April 2023

3. Dunhuang Pipa Manuscripts: "You Man Quzi"

Archaeological Context: The Dunhuang pipa manuscripts, discovered among the cache of ancient scores from the Mogao Caves, represent one of the earliest extant collections of Chinese plucked-lute notation. The fourteenth piece, titled You Man Quzi, was selected for reconstruction as part of this study to explore the potential for reviving lost performance practices through contemporary technological mediation.

Instrument Form and Structure: Although the manuscripts do not depict instruments directly, notational and rhythmic indicators suggest compatibility with the four- or five-string curved-necked pipa, a form consistent with those identified in Shanxi iconographies. The structure reflects a transitional phase between the Northern and Tang Dynasties.

Pipa-Holding Posture and Technique: Drawing on comparative iconographic evidence from Yungang and Yu Hong, the presumed playing posture aligns with the inverted or semi-vertical position, supporting alternating plucking motions similar to early mo and tiao gestures in modern terminology.

Reconstruction and AI Application: The musical reconstruction of You Man Quzi was realized using AI-assisted music generation tools such as Suno, which processed melodic fragments to create auditory renderings. These reconstructions aimed to blend historical tunings and rhythms with contemporary interpretive sensibilities, offering a speculative yet insightful reanimation of ancient soundscapes.

Interpretive Implications: This experiment demonstrates the potential of AI-assisted interpretation as both an analytical and creative tool. By combining historical sources with digital modeling, it bridges the gap between archaeological evidence and performative realization, proposing new ways to engage with the living heritage of Silk Road music.

Conclusion

The evolution of the pipa from the Northern Wei to the Sui Dynasty reflects a profound process of cultural integration along the Silk Road. Its transformation embodies the fusion of Han agrarian traditions with the artistic and technological influences of steppe nomadic and Central Asian cultures, illustrating how musical instruments can serve as living records of intercultural exchange.

The Persian-derived Qsl-type, introduced through Sogdian intermediaries, became the dominant model that persisted from the Northern Wei through the Tang Dynasty. Beyond the Yungang region, however, gradual regional adaptation took place as local artisans assimilated Han aesthetic

values while preserving distinctive foreign structural features. This duality—between adaptation and inheritance—characterizes the broader trajectory of pipa development in early medieval China.

The study's comparative typological and iconographic analyses clarify how cross-cultural contact shaped not only the morphology of the pipa but also its performative techniques and expressive possibilities. Furthermore, the experimental use of AI-assisted musical reconstruction demonstrates the potential of digital tools to bridge archaeological evidence with contemporary interpretation. Such approaches invite new dialogues between historical scholarship and modern creative practice, though the question of cultural authenticity must be addressed with critical sensitivity (see Table 1).

Table 1: Typological Classification and Cultural Origins of Early Pipa-Type and Lute Instruments across Eurasia

Region/ Cultural Sphere	**Instrument Type**	**Typological Code**	**Cultural Origin and Influence**
Persian Region	curved-necked pipa	Qs type (esp.QsI)	Originating in Persia, it was transmitted to China through Sogdian intermediaries. Served as the dominant type in Shanxi and adjacent regions throughout the Northern Wei–Tang periods.
Mesopotamia	curved-necked lute	Qw type (esp.QwI)	Derives from Mesopotamian lute traditions; reflects early West Asian influence in the formation of curved-necked instruments.
Indian Subcontinent	Straight-neck lute	Zs type (esp.ZsII)	Formed under Indian musical influence, emphasizing melodic ornamentation and the linear neck structure typical of South Asian lutes.
Greek Region	Straight-neck lute	Zs type (esp.ZsII)	Influenced by Hellenistic instruments such as the pandoura, this contributed to early prototypes of straight-neck designs through cross-Mediterranean exchange.

In summary, this research highlights three key contributions: A systematic methodology that combines typological classification with iconographic interpretation to trace the pipa's evolution in Shanxi during the Northern Wei–Sui periods; evidence that cross-cultural exchange along the Silk Road was a driving force in shaping instrument design, performance practice, and artistic identity; and the innovative application of AI technology as a means to revive ancient soundscapes and reimagine historical music in modern contexts. Future studies should extend this framework to broader Silk Road regions, refining AI-based methodologies to ensure historical accuracy and cultural sensitivity in the reconstruction of early music traditions.

References

Wang, G. (2015). *History of Chinese Music.* Beijing United Publishing Company.

Shen, Z. (1982). An outline of Chinese music history. Shanghai Literature and Art Publishing House.

Tanabe, N. (2015). A history of Chinese music (Chen Qingquan, Trans.). Shanxi People's Publishing House. (Original work published 1930s)

Hayashi, K. (1962). A study of East Asian musical instruments (Daosun Qian, Trans.). People's Music Publishing House.

Kishibe, S. (1962). Studies on the History of Tang Dynasty Music. University of Tokyo Press.

Xie, Y. (2015). *On pipa music and pipa culture in the Tang Dynasty.* Harbin Normal University, Harbin.

Chen, A. (2015). *"Huahua" (sinicization) and classification: A study on the type characteristics, performance methods, and humanistic existence of the Pipa from the Han to Tang Dynasties.* Unpublished doctoral dissertation, China Conservatory of Music, Beijing, China.

Wang, F. (2012). *Pipa performance scores.* Shanghai Music Publishing House.

Editorial Board of Yungang Grottoes Complete Works (Zhuo Zhang, Chief Ed.). (2019). *Yungang Grottoes complete works: Volume 10, Cave 12.* Qingdao Publishing Group.

Zhang, Q. (2010). *Hu merchants, Hu Teng dance, and Central Asians in China: An interpretation of the Yu Hong tomb.* Beiyue Literature and Art Publishing House.

Biography

Dr Yang Yani holds a Ph.D. in Musicology and is a full-time lecturer at the International College of Arts, Krirk University, Thailand. Her research focuses on music archaeology, iconography, and ethnomusicology, with a particular interest in pipa imagery from Northern Wei to Tang Dynasty grottoes and tombs. She has received the university's "Outstanding Graduate Student" award and has performed in numerous cross-cultural concerts. She also teaches interdisciplinary AIGC-based creative courses combining music, visual arts, and film.

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